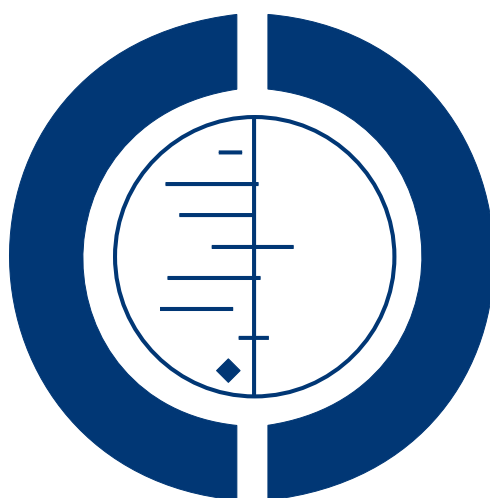


Indoor air modification interventions for prolonged non-specific cough in children (Review)

Donnelly D, Everard M, Chang AB



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[Intervention Review]

Indoor air modification interventions for prolonged non-specific cough in children

Deirdre Donnelly¹, Mark Everard², Anne B Chang³

¹Department of Clinical Genetics , Belfast City Hospital, Belfast, UK. ²Department of Paediatrics, Sheffield Children's Hospital, Sheffield, UK. ³Respiratory Medicine Level 3 Woolworths Bldg, Royal Children's Hospital, Brisbane and Menzies School of Health Research, CDU, Darwin, Brisbane, Australia

Contact address: Deirdre Donnelly, Department of Clinical Genetics , Belfast City Hospital, Lisburn Road, Belfast, BT9 7AB, UK. drdedonnelly@hotmail.com.

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ABSTRACT

Background

Non-specific cough has been defined as non-productive cough in the absence of identifiable respiratory disease or known aetiology and is common in childhood. These children are treated with a variety of therapies, including non-pharmacological treatments. There is a wide variety and a growing market for these non-pharmacological treatments that include air-modification modalities.

Objectives

To determine the efficacy of air-modification modalities, (ionisers, vaporisers, humidifiers, air filters, regular vacuuming), in treating children with non-specific cough.

Search methods

The Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, OLDMEDLINE and EMBASE databases were searched by the Cochrane Airways Group. The latest searches were performed in November 2008.

Selection criteria

All randomised controlled trials comparing air-modification modalities with a placebo treatment, for any duration.

Data collection and analysis

Results of searches were reviewed against pre-determined criteria for inclusion. Five papers were considered for inclusion but no eligible trials were identified and thus no data was available for analysis.

Main results

No randomised controlled trials that examined the efficacy of air-modification modalities in the management of prolonged, non-specific cough in children were found.

Authors' conclusions

Based on the evidence currently available, a recommendation can not be given for air-modification interventions in the treatment of prolonged, non-specific cough in children.

PLAIN LANGUAGE SUMMARY

Indoor air modification interventions for prolonged non-specific cough in children

Prolonged, non-specific cough is common in childhood and is treated with a variety of therapies. There is a growing market for non-pharmacological treatments and these include air-modification modalities, (ionisers, vaporisers, humidifiers, air filters and regular vacuuming). No randomised controlled trials examining the efficacy of air-modulation modalities in the management of prolonged, non-specific cough in children were found. Therefore, based on the evidence currently available, a recommendation for these treatments cannot be given. Due to the popularity of air-modulation modalities, randomised controlled trials in this area are clearly needed.

BACKGROUND

Cough is a very common and troublesome symptom of respiratory disease. Non-specific cough has been defined as non-productive cough in the absence of identifiable respiratory disease or known aetiology (Chang 2001) and is common in childhood. The majority of these children have no signs of other current disease processes and, in the absence of research to guide clinical practice, are treated with a variety of therapies. They present a major management problem and cause considerable anxiety to parents.

Treatment of cough is problematic, and many over-the-counter medications are readily available and widely used. These include anti-tussives, mucolytics and anti-histamines, though there is no good evidence for their effectiveness (Schroeder 2002). Two randomised controlled trials have been carried out on the use of asthma medication, (inhaled salbutamol and corticosteroids), in children with isolated, chronic cough, but neither recommended using these therapies (Chang 1998, Davies 1999). Antibiotics are frequently prescribed with variable effect. Difficulties in the interpretation of drug trials lie in the fact that cough usually resolves spontaneously, i.e. the period effect.

Non-pharmacological treatments, to compliment pharmacological therapies, are also very popular. There is a wide variety available and this is a growing market. These include air modifiers, e.g. ionisers, vaporisers, humidifiers, air filters, regular vacuuming and other methods for dust reduction, which are mainly used in the home. Ionisers remove particles from the air, which are likely to include airborne allergens and smoke particles, via electrostatic precipitation. A previous Cochrane review on ionisers in asthma concluded that their use cannot be recommended, (Blackhall 2003). One study reviewed showed an increase in the frequency of night-

time cough during the ionisation period and recommended that this be looked at further (Warner 1993). Many of these therapies are carried out without good evidence for their use. There is a paucity of randomised controlled trials in this area, and many studies in the literature are based on case reports. A systematic review examining the efficacy of air modification modalities for prolonged, non-specific cough in children would be useful.

OBJECTIVES

To determine the efficacy of air modification interventions, (ionisers, vaporisers, humidifiers, air filters, regular vacuuming), in treating children with non-specific cough.

METHODS

Criteria for considering studies for this review

Types of studies

All randomised controlled trials comparing non-pharmacological treatments with a placebo treatment.

Types of participants

All trials which included children under 18 years of age with prolonged (3 or more weeks) non-specific cough (dry and non-productive cough without any other respiratory symptom, sign or

systemic illness). An a priori subgroup analysis was planned for children < 7 years of age.

Exclusion criteria: cough related to mycoplasma, pertussis and chlamydia, presence of underlying cardio-respiratory condition, current or recurrent wheeze (>2 episodes), presence of other respiratory symptoms (productive cough, haemoptysis, dyspnoea), presence of other respiratory signs (clubbing, chest wall deformity, respiratory noises such as wheeze on auscultation and other adventitious sounds), presence of any sign of systemic illness (failure to thrive, aspiration, neurological or developmental abnormality), presence of lung function abnormality.

Types of interventions

All randomised controlled comparisons of air modification interventions versus placebo treatments in the management of non-specific cough. It was planned that trials only comparing two or more treatments without a placebo comparison group would not be included.

Trials that included the use of other medications or interventions were included if all participants had equal access to such medications or interventions.

The following interventions were evaluated;

- a) ionisers (positive and negative)
- b) vaporisers,
- c) humidifiers,
- d) air filters,
- e) regular vacuuming,
- f) other dust reduction methods (change of carpets, dust covers etc).

Types of outcome measures

Primary outcomes

Proportions of participants who were not cured or not substantially improved at follow up (clinical failure).

Secondary outcomes

1. proportions of participants who were not cured at follow up,
2. proportions of participants who not substantially improved at follow up,
3. mean difference in cough indices (cough diary, cough frequency, cough scores),
4. proportions experiencing adverse effects, e.g. behavioural changes, nausea, bronchospasm, hypersensitivity, burns, (side effects),
5. proportions experiencing complications e.g. requirement for medication change

The proportions of participants who failed to improve on treatment and the mean clinical improvement was determined using the following hierarchy of assessment measures (i.e.. where two or more assessment measures were reported in the same study, the outcome measure that was listed first in the hierarchy was used).

- i) Objective measurements of cough indices (cough frequency, cough receptor sensitivity, cough amplitude).
- ii) Symptomatic (Likert scale, visual analogue scale, level of interference of cough, cough diary) - assessed by the child.
- iii) Symptomatic (Likert scale, visual analogue scale, level of interference of cough, cough diary) - assessed by the parents/carers.
- iv) Symptomatic (Likert scale, visual analogue scale, level of interference of cough, cough diary) - assessed by clinicians.
- v) Airway markers consistent with infection or inflammation.

Search methods for identification of studies

The following topic search strategy was used to identify relevant randomised controlled trials listed from the electronic databases: (cough [MeSH] OR cough [text word] OR bronchitis [MeSH] OR bronchitis [text word]) AND (ioniser [MeSH] OR ioniser [text word] OR electrostatic precipitator [MeSH] OR electrostatic precipitator [text word] OR vapouriser [MeSH] OR vapouriser [text word] OR humidifier [MeSH] OR humidifier [text word] OR air filter [MeSH] OR air filter [text word] OR regular vacuuming [MeSH] OR regular vacuuming [text word] OR dust [MeSH] OR dust [text word] OR indoor air [MeSH] OR indoor air [text word] AND children or child [Mesh or text word]).

The full search strategies are listed in [Appendix 1](#).

Trials were identified from the following sources:

1. The Cochrane Central Register of Controlled Trials (CENTRAL Issue 4/2008), which includes the Cochrane Airways Group Specialised Trials Register.
2. MEDLINE (1966 - Nov 2008). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
3. OLD MEDLINE (1950-1965). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
4. EMBASE (1980 - Nov 2008). Topic search strategy combined with the RCT search filter as outlined in the Airways Group module.
5. The list of references in relevant publications.
6. Written communication with the authors of trials included in the review.

Data collection and analysis

Selection of studies

From the title, abstract, or descriptors, three reviewers (DED, ME & ABC) independently reviewed literature searches to identify potentially relevant trials for full review. Searches of bibliographies and texts were conducted to identify additional studies. From the full text, using specific criteria, the same two reviewers independently selected trials for inclusion. Agreement was measured using kappa statistics, where appropriate. Disagreement was resolved by consensus.

Data extraction and management

Trials that satisfied the inclusion criteria were to be reviewed and the following information recorded: study setting, year of study, source of funding, patient recruitment details (including number of eligible children), inclusion and exclusion criteria, randomisation and allocation concealment method, numbers of participants randomised, blinding (masking) of participants, care providers and outcome assessors, type of non-pharmacological therapy used, duration of therapy, co-interventions, numbers of patients not followed up, reasons for withdrawals from study protocol (clinical, side-effects, refusal and other), details on side-effects of therapy, and whether intention-to-treat analyses were possible. Data was to be extracted on the outcomes described previously. Further information was to be requested from the authors where required.

Assessment of risk of bias in included studies

Studies included in the review were to undergo quality assessment performed independently by all reviewers. Four components of quality were to be assessed:

1. Allocation concealment. Trials were to be scored as: Grade A: Adequate concealment, Grade B: Unclear, Grade C: Clearly inadequate concealment. (Grade A = high quality).
2. Blinding. Trials were to be scored as: Grade A: Participant and care provider and outcome assessor blinded, Grade B: Outcome assessor blinded, Grade C: Unclear, Grade D: No blinding of outcome assessor (Grade A, B = high quality).
3. Reporting of participants by allocated group. Trials were to be scored as: Grade A: The progress of all randomised children in each group described, Grade B: Unclear or no mention of withdrawals or dropouts, Grade C: The progress of all randomised children in each group clearly not described. (Grade A = high quality).
4. Follow-up. Trials were to be scored as: Grade A: Outcomes measured in >90% (where withdrawals due to complications and side-effects are categorised as treatment failures), Grade B: Outcomes measured in 80-90%, Grade C: Unclear, Grade D: Outcomes measured in <80%. (Grade A = high quality).

While only the allocation concealment quality assessment was to be displayed in the meta-analysis figures, all assessments were to be included in the "Characteristics of included studies" table. Inter-reviewer reliability for the identification of high quality studies for each component was to be measured by the Kappa statistic.

Each study was to be also assessed using a 1 to 5 scale described by Jadad 1996, and summarised as follows:

Was the study described as randomised? (1=yes; 0=no)

Was the study described as double blind? (1=yes; 0=no)

Was there a description of withdrawals and dropouts? (1=yes; 0=no)

Was the method of randomisation clearly described and appropriate? (1=yes; 0=no)

Was the method of double blinding well described and appropriate? (1=yes; 0=no)

Data synthesis

For the dichotomous outcome variables of each individual study, relative and absolute risk reductions were to be calculated using a modified intention-to-treat analysis. This analysis assumes that children not available for outcome assessment have not improved (and probably represents a conservative estimate of effect). An initial qualitative comparison of all the individually analysed studies was to examine whether pooling of results (meta-analysis) was reasonable. This took into account differences in study populations, inclusion/exclusion criteria, interventions, outcome assessment, and estimated effect size.

The results from studies that met the inclusion criteria and reported any of the outcomes of interest were to be included in the subsequent meta-analyses. The summary weighted risk ratio and 95% confidence interval (fixed effects model) were to be calculated using the inverse of the variance of each study result for weighting (Cochrane statistical package, RevMan version 4.1). The number needed to treat was to be calculated using the summary odds ratio and the average control event rate described in the relevant studies. The cough indices were assumed to be normally distributed, continuous variables so the mean difference in outcomes could be estimated (weighted mean difference). If studies reported outcomes using different measurement scales, the standardised mean difference was to be estimated. Any heterogeneity between the study results was to be described and tested to see if it reached statistical significance using a chi-squared test. The 95% confidence interval estimated using a random effects model was to be included whenever there were concerns about statistical heterogeneity.

Subgroup analysis and investigation of heterogeneity

A priori sub-group analysis was planned by study populations (children less than 7 years of age, and children over 7 years of age) and by interventions:

1. ionisers (positive and negative),
2. vaporisers,
3. humidifiers,
4. air filters,
5. regular vacuuming,
6. other dust reduction modalities.

Sensitivity analysis

Sensitivity analyses were planned to assess the impact of the potentially important factors on the overall outcomes: a) study quality; b) study size; c) variation in the inclusion criteria; d) differences in the medications used in the intervention and comparison groups; e) differences in outcome measures; and f) analysis by “treatment received” rather than “intention-to-treat”.

RESULTS

Description of studies

See: [Characteristics of excluded studies](#).

The searches identified five potential studies, none fulfilled the study eligibility criteria, i.e. none were related to cough and most were related to asthma and allergy, particularly house dust mite and mould.

Risk of bias in included studies

Not applicable.

Effects of interventions

The Airway Group search identified 600 potentially relevant titles. After assessing the abstracts, five studies were considered for inclusion into review. None of the studies fulfilled study criteria.

DISCUSSION

No randomised controlled trials comparing interventions of air modification in children with non-specific cough were identified. Cohort studies were also not available and thus no guide is available to guide any time response.

AUTHORS' CONCLUSIONS

Implications for practice

Based on the evidence currently available from randomised controlled trials, a recommendation can not be given for air modification interventions in the treatment of prolonged, non-specific cough in children.

Implications for research

Given the popularity of air modification interventions, randomised controlled trials of these interventions to determine the effectiveness in treating children with non-specific cough are clearly needed. Trials should be parallel studies and double blind, given the known problems in studying cough, specifically the large placebo and time period effects ([Chang 1999](#)). Outcome measures for the clinical studies on cough should be clearly defined using validated subjective data and supported by objective data when possible.

ACKNOWLEDGEMENTS

The preparation and continued updating of this review would not have been possible without the help of Ms. Elizabeth Arnold, Mr. Toby Lasserson and Dr Chris Cates of the Cochrane Airways Group.

REFERENCES

References to studies excluded from this review

Chervinskaya 1995 *{published data only}*

Chervinskaya AV, Zilber NA. Halotherapy for treatment of respiratory diseases. *Journal of Aerosol Medicine* 1995;**8**(3): 221–32.

Daugbjerg 1988 *{published data only}*

Daugbjerg P, Brenoe E, Henriksen E, Ibsen KK. Ion generator and asthmatic bronchitis/bronchial asthma. Evaluation of an ion generator in the treatment of recurrent asthmatic bronchitis and bronchial asthma [Iongenerator og astmatisk bronchitis/asthma bronchiale. Evaluering af iongenerator i behandlingen af recidiverende astmatisk

bronchitis og asthma bronchiale hos børn]. *Ugeskrift for Læger* 1988;**150**(2):90–4.

Huang 1995 *{published data only}*

Huang SW, Kimbrough JW. Effect of air cleaners on mould count in the air and on the symptoms of perennial rhinitis. *Pediatric Asthma Allergy & Immunology* 1995;**9**(4):205–11.

Warner 1993 *{published data only}*

Warner JA, Marchant JL, Warner JO. Double blind trial of ionisers in children with asthma sensitive to the house dust mite. *Thorax* 1993;**48**(4):330–3.

Zwemer 1973 *{published data only}*

Zwemer RJ, Karibo J. Use of laminar control device as adjunct to standard environmental control measures in

symptomatic asthmatic children. *Annals of Allergy* 1973;**31**(6):284–90.

Additional references

Blackhall 2003

Blackhall K, Appleton S, Cates CJ. Ionisers for chronic asthma (Cochrane review). *Cochrane Database of Systematic Reviews* 2003, Issue 2. [DOI: 10.1002/14651858.CD002986]

Chang 1998

Chang AB, et al. A randomised, placebo controlled trial of inhaled salbutamol and beclamethasone for recurrent cough. *Archives of Disease in Childhood* 1998;**79**(1):6–11.

Chang 1999

Chang AB. Isolated cough: probably not asthma. *Archives of Disease in Childhood* 1999;**80**:211–3.

Chang 2001

Chang AB, Asher MI. A review of cough in children. *Journal of Asthma* 2001;**38**(4):299–309.

Davies 1999

Davies MJ, et al. Persistent nocturnal cough: randomised controlled trial of high dose inhaled corticosteroid. *Archives of Disease in Childhood* 1999;**81**(1):38–44.

Jadad 1996

Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJ, Gavaghan DJ, et al. Assessing the quality of reports of randomised trials: is blinding necessary?. *Controlled Clinical Trials* 1996;**17**(1):1–12.

Schroeder 2002

Schroeder K, Fahey T. Should we advise parents to administer over the counter cough medicines for acute cough? Systematic review of randomised controlled trials. *Archives of Disease in Childhood* 2002;**86**(3):170–175.

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Chervinskaya 1995	Study on halotherapy, given to adults in a halochamber
Daugbjerg 1988	Adult study in asthmatic patients, using ion generators
Huang 1995	Study of children with perennial rhinitis and mould allergy, given air cleaners in the bedroom
Warner 1993	Study of asthmatic children sensitive to house dust mite, given ionisers in the living room during the day, and in the bedroom at night
Zwemer 1973	Study of asthmatic children sensitive to house dust mite, given an air filter in the bedroom

DATA AND ANALYSES

This review has no analyses.

APPENDICES

Appendix I. Search strategies

CENTRAL	MEDLINE	EMBASE
#1. COUGH #2. BRONCHITIS #3. (cough* or bronchit*) #4. (#1 or #2 or #3) #5. AIR IONIZATION #6. (ioniser* or ionizer*) #7. NEBULIZERS AND VAPORIZERS #8. (vaporizer* or vaporiser* or vapourizer* or vapouriser*) #9. HUMIDITY #10. humidif* #11. FILTRATION #12. (air near filter*) #13. (air near filtrat*) #14. HOUSEKEEPING #15. FLOORS AND FLOORCOVERINGS #16. (vacuuming or Hoover*) #17. (vacuum* near clean*) #18. DUST #19. dust* #20. (electrostatic near precipitat*) #21. AIR POLLUTION INDOOR #22. (indoor near air) #23. (#5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22) #24. (#23 and #4)	1. exp COUGH/ 2. exp BRONCHITIS/ 3. (cough\$ or bronchit\$).mp. 4. or/1-3 5. exp AIR IONIZATION/ 6. (ioniser\$ or ionizer\$).mp. 7. exp "NEBULIZERS AND VAPORIZERS"/ 8. (vapori#er\$ or vapouri#er\$).mp. 9. exp HUMIDITY/ 10. humidif\$.mp. 11. exp FILTRATION/ 12. (air adj3 (filter\$ or filtrat\$)).mp. 13. HOUSEKEEPING/ 14. exp "FLOORS AND FLOORCOVERINGS"/ 15. (vacuuming or Hoovering or (vacuum\$ adj3 clean\$)).mp. 16. exp DUST/ 17. dust\$.mp 18. (electrostatic adj3 precipitat\$).mp. 19. exp AIR POLLUTION, INDOOR/ 20. (indoor\$ adj3 air).mp. 21. or/5-20 22. 4 and 21 (This search is combined with a RCT filter as outline in the Airways Group Module)	1. exp COUGHING/ 2. exp Bronchitis/ 3. (cough\$ or bronchit\$).mp. 4. or/1-3 5. exp air/ 6. (ioniser\$ or ionizer\$).mp. 7. exp vaporizer/ 8. exp Humidifier/ 9. (vapori#er\$ or vapouri#er\$).mp. 10. humidif\$.mp. 11. exp FILTRATION/ 12. (air adj3 (filter\$ or filtrat\$)).mp. 13. household/ 14. exp Cleaning/ 15. (vacuuming or Hoover\$ or (vacuum\$ adj3 clean\$)).mp. 16. exp dust/ 17. dust\$.mp. 18. (electrostatic adj3 precipitat\$).mp. 19. exp indoor air pollution/ 20. (indoor\$ adj3 air).mp. 21. or/5-20 22. 4 and 21 (This search is combined with a RCT filter as outline in the Airways Group Module)

WHAT'S NEW

Last assessed as up-to-date: 20 January 2009.

Date	Event	Description
21 January 2009	New search has been performed	Literature search re-run; no new studies identified

HISTORY

Protocol first published: Issue 4, 2004

Review first published: Issue 3, 2006

Date	Event	Description
28 July 2008	Amended	Converted to new review format.
3 May 2006	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

DD wrote the protocol based on previous protocols for treatment of non specific cough in children. ME and AC contributed to the protocol generation and guided the process. For the review, DD, ME and AC selected abstracts on the search conducted by Liz Arnold of the Cochrane Airways Group. All contributed to writing of the review.

DECLARATIONS OF INTEREST

None known.

INDEX TERMS

Medical Subject Headings (MeSH)

Air Pollution, Indoor [adverse effects; *prevention & control]; Cough [etiology; *prevention & control]; Filtration [instrumentation]; Housekeeping [methods]; Humidity; Nebulizers and Vaporizers; Vacuum

MeSH check words

Child; Humans